A Critical Perspective on Radically Innovating Personal Mobility

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Automotive research today is mostly concerned with incremental improvement. With an automated vehicle in mind, increased safety, reduced fuel consumption, and the possibility of non-driving-related activities are anticipated. However, the challenges of future mobility require a critical rethinking of mobility in its entirety, including the availability of personalized and motorized mobility. With this video, we want to stimulate discussions on more radical innovation in mobility. In detail, we want the audience to imagine what challenges a world without individually driven cars would pose.

CCS Concepts: • **Human-centered computing → HCI design and evaluation methods**; **HCI theory, concepts and models**.

Additional Key Words and Phrases: video prototyping; radical innovation; critiquing; mobility; automated traffic

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1 INTRODUCTION

Driving automation promises to increase safety and fuel efficiency and relieve people from driving-related tasks. This is expected to change the future of everyday mobility: People will be able to engage in tasks such as working, reading, sleeping, or even painting in times they used to drive before [14, 25]. Moreover, people like children, the elderly, or the physically impaired who are currently not able to drive, will have the possibility to travel independently. While the driving automation technology aims at reducing CO2 emissions, the aforementioned possibilities it provides can lead to increasing rates of commutes and, consequently, environmental issues [28].

Currently, on-road transportation highly relies on individual mobility and is predicted to contribute to 10-20% of worldwide climate change by 2050s [31]). It is, therefore, required to introduce new modes of mobility that are not designed for solo drivers/passengers. In the last years, several researchers and industries have introduced futuristic

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concepts for shared mobility, such as ride-sharing and automated public transport systems. However, the overarching question is: **How integratable are these concepts in people's everyday mobility practices?**

Therefore, we see the need to trigger rethinking mobility fundamentally. Current visions of manufacturers or consultants often predict a more or less similar traffic organization of today's mobility: foremost individual motorized traffic (e.g., see KPMG's vision of 2030's mobility[1]).

In the Dagstuhl Seminar 22222 "Radical Innovation and Design for Connected and Automated Vehicles", we envisioned numerous scenarios to remodel mobility fundamentally. In one exercise, the question of "What if?" was raised in combination with the topic of ***no*** *more individual motorized traffic* in the context of a card game (see Figure 1). Afterward, the perspective of several users and stakeholders were investigated. In this video, we show some of the direct users' views, for example, of a craftsperson. Indirect stakeholders such as manufacturers or city planners were not included but are relevant.

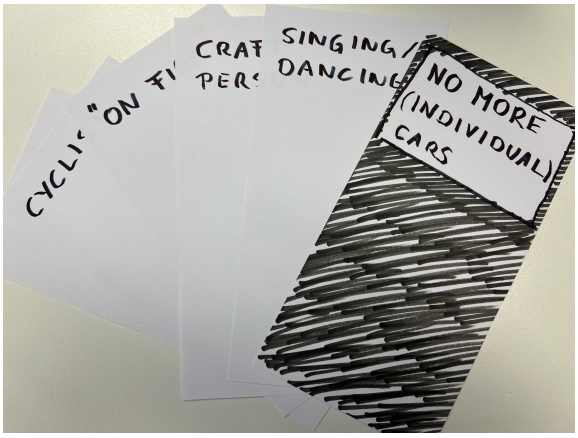

Fig. 1. Game cards. The black card represents the scenario, the white cards the perspective the actors take. After drawing the scenario, the "players" have to imagine the experiences of their exemplary person for the scenario.

2 INNOVATION IN MOBILITY

Current trends in automotive research are characterized by evolutionary steps instead of revolution. Looking at the large scale of traffic, Soe [32] refers to evolution as "future smart cities will be only incrementally autonomous" and revolution as "future smart cities will have fully autonomous traffic". With the current approaches employed by established European manufacturers such as Mercedes Benz or Audi, evolution can also be expected[2].

This is also the case in automotive user interface research where effects of automation are mostly evaluated in terms of external communication [5, 6, 11–13, 15, 21, 23], information needs within the vehicle [7, 8, 10, 20, 24], cooperation and takeovers [3, 4, 34], socially acceptable behavior [26, 27, 29], and novel interactions within the vehicle [1, 2, 25]. Additionally, simulators are designed and evaluated to allow for realistic experiences both in manual and automated vehicles [9, 16–19].

[1]https://www.youtube.com/watch?v=4B7mZFU2sB4; Accessed: 05.06.2022
[2]https://www.reuters.com/article/us-daimler-autonomous-level3-idUSKBN27C3A0; Accessed: 07.06.2022

When designing for (radical) innovation in mobility, one must incorporate relevant stakeholders. As described by Van der Hoogen et al. [33], mobility is a multi-stakeholder problem. They distinguish four categories of stakeholders: Enablers that allocate resources (e.g., government, businesses), providers working on innovative research and design (e.g., universities), utiliser that create suitable products and services (e.g., companies), and users (e.g. citizens, workers, investors). Even within these groups, the goals can vary strongly. Therefore, in this video, we take the perspective of different users.

Furthermore, besides addressing difference between individual goals, the design of future mobility should consider the integration of these radical concepts into peoples' everyday mobility practices. This tackles questions such as: Is this innovation inclusive for different mobility practices? Is it generalizable to the practices of all target users? Can it be accepted as an alternative to the existing practices?

3 METHODOLOGY

Video Prototyping is a long-adapted method in Human-Computer Interaction. The benefits include the easy implementation of otherwise difficult-to-achieve interaction paradigms or scenarios. Therefore, the possibility to view impacts and provide a common basis for discussions on human-machine interfaces is crucial to radical innovations. While video prototyping often relates to solution-based approaches [22, 30], we employed the technique to enable critical thinking about various scenarios. Therefore, in an entertaining fashion, our videos aim to highlight some of these potential challenges. This does not mean that the underlying goal of the scenario is undesirable but that multiple views are to be explored.

4 PERSPECTIVE ON FUTURE MOBILITY

In the video, the question of the impact of ***no*** *more individual motorized traffic* on different user groups is explored. Particularly, we highlight the following scenarios/problem fields:

(1) Inability to use unmotorized (individual) traffic due to injury
(2) Requirements of workers/craftspeople to take along tooling to the workplace
(3) Social acceptability and fun to ride in the case of an enthusiastic listener of music
(4) Emergency use cases, for example, firefighter who has to extinguish a fire

In particular, this methodology enabled us to provide a common understanding of the use case and an approachable way to describe unwanted side effects of radical innovations. This video should spark discussion within the AutoUI community to rethink the mobility of the future more critically.

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